Case No. 4. Harry S. O. P. D. No. 51616. Age 49. Referred from nerve clinic, April 2, 1919. Complains of dizziness since October, 1918, following attack of Influenza. Attacks becoming more frequent and severe and come on with change of position of head. Staggers at times forward and to the right. Has never fallen. No deafness. Tinnitus intermittent and more in right ear.

Neuro-otological examination—Hearing: good in both ears. Rotation to right: horizontal nystagmus to left, 25 seconds duration. Past pointing: normal. Falling: normal. To left: horizontal nystagmus to right, 30 seconds duration. Past pointing: normal. Falling: normal. Caloric: water 68 degrees. Right ear: faint rotary nystagmus to the left after 80 seconds. Past pointing: correct direction but shortened for both arms. Falling: normal. Head back: 60 degrees horizontal nystagmus to left and past pointing correct for both arms. Left ear: no nystagmus after 4 or 5 minutes douching (2 examinations). Past pointing: correct direction for both arms. Vertigo: normal. Falling: normal. Head back: 60 degrees marked horizontal nystagmus to right, past pointing correct for both arms. Head up and nystagmus disappears.

Summary—1. All reactions go through except nystagmus reaction from left vertical.
2. Right vertical canals pathway slightly impaired shown by prolonged time to produce reaction and shortened past pointing.

Conclusion—Lesion in upper half of pons on left side between the division of the fibers of the left vertical canals and the posterior longitudinal bundle. The slight impairment of the right verticals may be explained by pressure of the lesion on the right pons.

Comment—No diagnosis has yet been made by the neurologist due to the absence of definite localizing neurological symptoms.

Case No. 5. Bosilios S. O. P. D. Referred from nerve clinic. Complains of dizziness since March, 1919. Comes on suddenly and is increasing in severity. Attacks come with change of position of head. Staggers to right. Has fallen to right. Says he has no trouble with hearing and no tinnitus.

Neuro-otological examination—Hearing: complete deafness in right ear (duration unknown). Left ear: normal. Romberg to right, which does not change with position of head. Rotation to right: horizontal nystagmus to left, 15 seconds duration. Past pointing: both arms correct direction. Falling: good. To left: horizontal nystagmus to right, 7 seconds duration. Past pointing: both arms correct. Falling: good. Caloric: water 68 degrees. Right ear: no nystagmus after 4 minutes (two examinations). No past pointing. Head back: no nystagmus or past pointing. Left ear: rotary nystagmus to right, poor amplitude so that difficult to note, after 110 seconds. Past pointing: none for either arm. Head back: marked horizontal nystagmus to right. Past pointing: correct, both arms. Douching left ear with head back 60 degrees and water 68 degrees: marked horizontal nystagmus to right in 27 seconds. Past pointing: correct, both arms. Head up and no nystagmus or past pointing.

Summary—1. Complete destruction of vestibular and cochlea portion of right side.
2. Marked impairment (almost destruction) of fibers from left verticals.
3. Pictures of right cerebello pontine angle lesion of recent origin (not large enough to completely destroy fibers of right verticals as yet).

Comment—No diagnosis as yet by the nerve clinic due to lack of definite localizing symptoms.

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COMPARISON OF THE ACTION OF ROENTGEN RAYS AND RADIUM.*

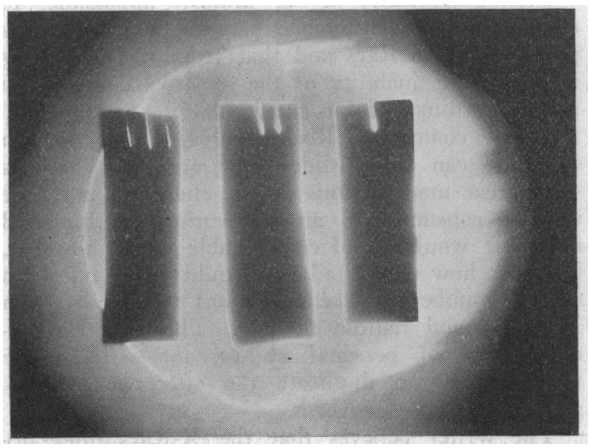
By ALBERT SOILAND, M. D., Los Angeles.

In a former paper, the writer described the source and distribution of both radium and X-Rays,[1] and at this time would like to call attention to a comparison of the actinicity of radium and Roentgen rays.

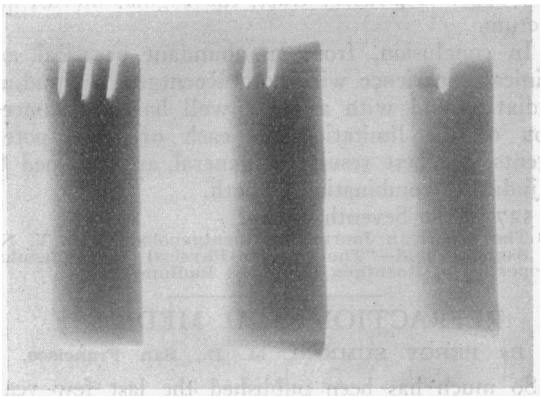
In going over the literature devoted to the physics and therapeutics of radium, one is struck by a confusion of statements as to the penetration and distance traversed by the various radium rays. Also the terms, alpha, beta, and gamma rays, emanation, particles, and waves which are so frequently interchanged that it is difficult even for one familiar with radio physics to intelligently follow the discourse. These terms are often used indiscriminately to designate each and all of the different forms of energy derived from radium.

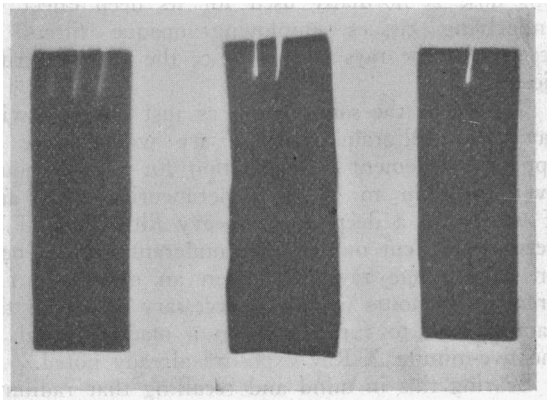
For the purpose of elucidating the following photographic experiments with radium and Roentgen rays, a few fundamental facts will be reiterated. Radium element in process of decay gives off emanation, an inert gas called niton, and alpha particles, the latter being atoms of positive polarity. The emanation is unstable and loses more alpha particles, after which it is known as radium A. Radium A gives off alpha particles, then resolves itself into radium B, changing in turn to radium C, D, E, and F. The radio active period with which we have mostly to deal is the transition of radium C, for this compound gives off in quantity, alpha, and also the beta and gamma rays, with which we are concerned therapeutically. The alpha rays or particles are not considered seriously in therapeutics. They are of exceedingly limited range of activity and are easily arrested by any filter. If allowed to strike the unprotected skin in quantity, they give rise to a very disagreeable but quite superficial dermatitis. The beta particles are of negative polarity, similar to the Roentgen cathode stream, and in their transmutation give rise to true beta ethereal waves, which the writer believes to be the real therapeutic factors in radium. The gamma radiation is a purely ethereal one of higher penetration and exceedingly short wave length, closely related to the Roentgen ray. The primary beta rays or negative electrons from radium are corpuscular streams, which upon meeting an obstruction are capable of transforming their energy into secondary beta rays, and it is these waves or disturbances that produce the well-known metabolic changes in living protoplasm. The gamma rays are not corpuscular, but at their point of arrest give off secondary rays similar to the beta, and as already stated are of shorter wave length, of relatively higher frequency, and greater penetration. The beta corpuscular stream or primary beta rays

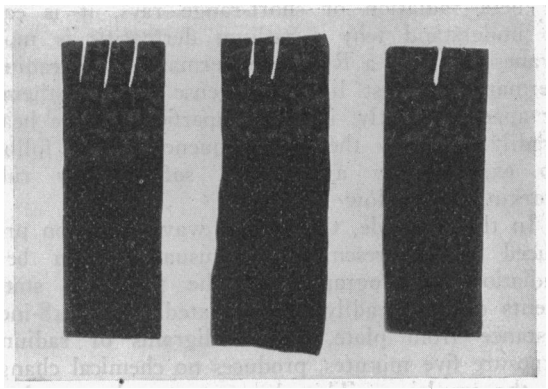
* Read before the Forty-eighth Annual Meeting of the Medical Society, State of California, Santa Barbara, April, 1919.



4. X-Ray exposure on same lead plates, 5 milliamperes of current, 100 kilovolts, 8 inch skin distance, time 5 minutes. Note intensive action on lead plates, particularly the one and two millimeter thickness.







5. Radium 100 milligrams, 8 inch distance from covered negative. Exposure one hour. Note radio activity in lead plates to an equal degree, also secondary beta rays with negative polarity, which are plainly demonstrated from each south pole of the lead.

6. X-Ray exposure, 6 inch back up, 100 kilovolts, 50 milliamperes, 8 inch distance from covered negative. (a) Exposure one second. (b) Same set up and technic, exposure ten seconds. Note intensive actinic and chemical action on lead in direct proportion to thickness of same.

and to a lesser degree the gamma rays from radium have the power of imparting radio activity to practically all substances. This induced radio activity is best exemplified in the denser metals, those of highest atomic weight, showing this process in the most intense form. This induced radio activity is of very transient nature, the objects affected readily yielding up their energy in heat. In an energized X-Ray tube, the cathode corpuscular stream is all transformed within the tube itself; hence, we get no secondary beta X-Rays. We do get, however, from such an X-Ray tube an enormous amount of ethereal wave disturbances, which when arrested or reach their point of absorption give off precisely the identical wave form of energy that is exhibited by all the active principles of radium.

To make a comparative rating between a single massive Roentgen exposure and a single one with radium would involve many factors and render such a task exceedingly difficult. In a functionating X-Ray tube, we have a potential source of radio activity, greater perhaps than in all the world's available radium, at least greater than all the radium in the United States. To establish a standard technic under such conditions, one would be compelled to reduce the X-Ray output in an individual unit to a degree that would correspond to a standard radium equivalent. The next step would be to use suitable filters to insure wave radiation of the same length and frequency for both agents. Then if the time element of exposure could be harmonized, it would make absolutely no difference which agent be employed. In such an exposure with either agent, the tissue changes would be exactly alike, both clinically and microscopically.

At present, a standardization as just outlined is impossible, and we will have to confine ourselves to discuss radium in the amounts usually available for practical work. Outside of a half dozen large Eastern institutions, this would range from 100 to 200 milligrams element.

In Roentgen therapeutics, the ordinary set up of a Coolidge tube, working on 100 K. V. pressure, with 5 M. A., at an 8-inch skin distance without filter, will produce an intensive erythema or surface reaction sufficient to destroy a superficial epithelioma in one five-minute application. As even this short exposure has been found to produce lasting X-Ray dermatitis in susceptible individuals, such an application is undesirable in skin work, so

this dose is normally used for its deep effect on underlying tissues employing opaque filters to screen out the rays that produce the surface irritation.

To obtain the same action as just outlined with say 100 milligrams radium, we would have to apply this element or emanation for several hours over the skin to get the therapeutic effect, and if we desire a deep effect, heavy filters would be necessary to cut out the preponderant radium beta or short range rays, and then an exposure of a great many hours would be necessary to permit the gamma rays to functionate in a manner equal to the five-minute X-Ray exposure already noted.

Bearing this in mind and recalling that radium's greatest source of energy lies in its preponderance of beta radiation or short-range rays, it is easy to understand why a radium dermatitis is more evanescent than a Roentgen dermatitis. A radium dermatitis is just like an intense solar erythema. It appears quickly, is quite superficial, hence heals readily. Exactly the same sequence would follow an exposure by a so-called soft X-Ray tube working under low K. V.

In this example, the X-Ray wave radiation produced would resemble the usual radium beta radiation. Photographically, the foregoing statements can be readily demonstrated. At a 48-inch distance from plate, 150 milligrams of radium, exposure five minutes, produces no chemical change in the emulsion. This demonstrates that no beta rays reach the plate, and that the gamma rays pass through the emulsion unchanged. Placing strips of lead on plate and repeating experiment, but increasing time to ten minutes, shows a slight fogging of the emulsion due to the induced radio activity in the lead strips. The same experiment carried to one-half hours exposure with a fresh plate shows the shadows more clearly.

Performing the same experiment with an X-Ray exposure at the same distance, the emulsion of the plate is blackened with the shortest exposure we can make, viz. 1/60 of a second. With radium (200 mg.) distance ten feet, no image was obtained by either primary or secondary rays in one hour's exposure.

In order to ascertain the distance at which a serviceable X-Ray plate could be made with an ordinary exposure, we rigged up a tube and plate to get the greatest space possible in our laboratory. This measured forty feet from anode to negative. An exposure of ten seconds, fifty milliampere, on a six-inch back up, gave us a serviceable plate, that is where bone detail can readily be seen, attention being directed to the fact that the total X-Ray energy used was quite ordinary in amount. The photographic experiments were made under working conditions as nearly alike as possible. Thus the average amount of radium used at an ordinary treatment rarely exceeds 100 milligrams element, and for all the plates made at working distance, this amount is used. In the long range exposures, 150 and 200 milligrams element are employed. The X-Ray plates were made with the regular standard Coolidge tube settings.

Photographically, it is almost impossible to demonstrate the difference between the dermatitis produced by X-Rays and that from radium. This is due to the inability of the sensitive emulsion to register ordinary color changes.

Every competent Roentgenologist and radium therapist can show slides and give case records of a great many lesions cured; therefore, no time will be consumed in an elaboration of this kind now. It would be of considerable value, however, to know how many failures would ensue out of a certain number of like conditions treated by both Roentgen and radium therapy. The test then becomes one of personal ability, for with ample radium one can duplicate the effects of Roentgenization and vice versa.

The writer believes that the X-Rays offer decided advantages in the treatment of lesions covered by, or affecting, the epithelium. On mucous membranes or in cavities where soft tissues predominate, radium becomes the element of choice. This is particularly true in lesions involving the mouth and upper respiratory tract, the vagina, uterus, and rectum.

In conclusion, from an abundant practical and clinical experience with both Roentgen and radium radiation and with a fairly well balanced conception of the limitations of each of these potent agents, the best results in general are obtained by a judicious combination of both.

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[1] The American Journal of Roentgenology, Vol. V, No. 8, August, 1918—"The Electro-Physical and Chemical Properties of Roentgen Rays and Radium."

REFRACTION AND MEDICINE.

By PERCY SUMNER, M. D., San Francisco.

So much has been published the last few years on focal infections that most physicians are fully alive to the dangers caused by these and usually institute a careful search for the offending member, when there is any obscurity as to the cause of the trouble of which the patient complains. Of course any movement of this sort is apt to be overdone and frequently one finds a patient minus teeth and tonsils and possibly other things that may still complain of indefinite and indeterminate discomforts.

It is for this class of patients that I am now taking the liberty of asking you as physicians if you have determined the condition of their eyes; have they errors of refraction that have either not been corrected at all or if treated then only superficially by an optician, or an oculist who does not appreciate the growing importance of thorough refraction in this age where the stress of life bears particularly hard on the nervous system? And I may here state that there is no greater drag on the nervous system or a spendthrift of nervous energy than the ciliary muscles in their attempt to give clear and sharp vision in the presence of even a small degree of refractive error.

Most of the people who have been subjected to the focal infection search often have an underlying unstable nervous balance, and when every-